

1. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 25x^3 + 75x^2 - 16x - 48$$

- A.  $z_1 \in [-3.16, -2.71]$ ,  $z_2 \in [-1.32, -1.21]$ , and  $z_3 \in [1.09, 1.63]$   
B.  $z_1 \in [-1.28, -1.18]$ ,  $z_2 \in [1.09, 1.35]$ , and  $z_3 \in [2.81, 3.32]$   
C.  $z_1 \in [-3.16, -2.71]$ ,  $z_2 \in [-0.86, -0.49]$ , and  $z_3 \in [0.52, 0.91]$   
D.  $z_1 \in [-4.08, -3.92]$ ,  $z_2 \in [0.08, 0.21]$ , and  $z_3 \in [2.81, 3.32]$   
E.  $z_1 \in [-0.9, -0.7]$ ,  $z_2 \in [0.52, 0.96]$ , and  $z_3 \in [2.81, 3.32]$
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2. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{20x^3 - 106x^2 + 112x - 30}{x - 4}$$

- A.  $a \in [79, 82]$ ,  $b \in [-426, -424]$ ,  $c \in [1811, 1818]$ , and  $r \in [-7295, -7290]$ .  
B.  $a \in [79, 82]$ ,  $b \in [212, 216]$ ,  $c \in [965, 973]$ , and  $r \in [3836, 3844]$ .  
C.  $a \in [17, 26]$ ,  $b \in [-47, -44]$ ,  $c \in [-27, -22]$ , and  $r \in [-109, -104]$ .  
D.  $a \in [17, 26]$ ,  $b \in [-28, -23]$ ,  $c \in [4, 11]$ , and  $r \in [-1, 5]$ .  
E.  $a \in [17, 26]$ ,  $b \in [-192, -184]$ ,  $c \in [855, 861]$ , and  $r \in [-3457, -3450]$ .
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3. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{6x^3 + 28x^2 - 68}{x + 4}$$

- A.  $a \in [-27, -23]$ ,  $b \in [123, 125]$ ,  $c \in [-498, -495]$ , and  $r \in [1913, 1919]$ .  
B.  $a \in [3, 9]$ ,  $b \in [4, 9]$ ,  $c \in [-19, -11]$ , and  $r \in [-5, -3]$ .  
C.  $a \in [-27, -23]$ ,  $b \in [-68, -63]$ ,  $c \in [-277, -267]$ , and  $r \in [-1157, -1153]$ .

D.  $a \in [3, 9], b \in [51, 53], c \in [208, 211]$ , and  $r \in [762, 767]$ .

E.  $a \in [3, 9], b \in [-6, 1], c \in [4, 15]$ , and  $r \in [-125, -117]$ .

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4. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 10x^3 - 21x^2 - 135x - 50$$

A.  $z_1 \in [-4.5, -1.5], z_2 \in [-0.52, -0.38]$ , and  $z_3 \in [5, 7]$

B.  $z_1 \in [-4.5, -1.5], z_2 \in [-0.52, -0.38]$ , and  $z_3 \in [5, 7]$

C.  $z_1 \in [-6, -4], z_2 \in [0.36, 0.46]$ , and  $z_3 \in [1.5, 4.5]$

D.  $z_1 \in [-6, -4], z_2 \in [0.01, 0.37]$ , and  $z_3 \in [5, 7]$

E.  $z_1 \in [-6, -4], z_2 \in [0.36, 0.46]$ , and  $z_3 \in [1.5, 4.5]$

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5. Factor the polynomial below completely, knowing that  $x - 3$  is a factor. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3 \leq z_4$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 9x^4 + 9x^3 - 163x^2 + 115x + 150$$

A.  $z_1 \in [-5.2, -4.7], z_2 \in [-1.62, -1.48], z_3 \in [0.52, 0.63]$ , and  $z_4 \in [2.4, 3.2]$

B.  $z_1 \in [-5.2, -4.7], z_2 \in [-3.05, -2.99], z_3 \in [0.12, 0.28]$ , and  $z_4 \in [4, 5.3]$

C.  $z_1 \in [-3.7, -2], z_2 \in [-0.65, -0.6], z_3 \in [1.47, 1.5]$ , and  $z_4 \in [4, 5.3]$

D.  $z_1 \in [-5.2, -4.7], z_2 \in [-0.74, -0.64], z_3 \in [1.64, 1.74]$ , and  $z_4 \in [2.4, 3.2]$

E.  $z_1 \in [-3.7, -2], z_2 \in [-1.71, -1.63], z_3 \in [0.66, 0.71]$ , and  $z_4 \in [4, 5.3]$

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6. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{10x^3 + 26x^2 - 68x - 53}{x + 4}$$

- A.  $a \in [-42, -33]$ ,  $b \in [-134, -130]$ ,  $c \in [-607, -603]$ , and  $r \in [-2473, -2463]$ .  
B.  $a \in [-42, -33]$ ,  $b \in [185, 188]$ ,  $c \in [-818, -809]$ , and  $r \in [3195, 3197]$ .  
C.  $a \in [9, 11]$ ,  $b \in [-30, -21]$ ,  $c \in [52, 57]$ , and  $r \in [-321, -310]$ .  
D.  $a \in [9, 11]$ ,  $b \in [-16, -13]$ ,  $c \in [-14, -10]$ , and  $r \in [-8, -1]$ .  
E.  $a \in [9, 11]$ ,  $b \in [66, 70]$ ,  $c \in [196, 202]$ , and  $r \in [722, 739]$ .
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7. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{6x^3 + 28x^2 - 62}{x + 4}$$

- A.  $a \in [4, 10]$ ,  $b \in [51, 53]$ ,  $c \in [207, 212]$ , and  $r \in [762, 773]$ .  
B.  $a \in [4, 10]$ ,  $b \in [-6, 1]$ ,  $c \in [8, 13]$ , and  $r \in [-115, -105]$ .  
C.  $a \in [-25, -21]$ ,  $b \in [120, 125]$ ,  $c \in [-503, -493]$ , and  $r \in [1917, 1926]$ .  
D.  $a \in [4, 10]$ ,  $b \in [3, 8]$ ,  $c \in [-17, -14]$ , and  $r \in [2, 3]$ .  
E.  $a \in [-25, -21]$ ,  $b \in [-72, -65]$ ,  $c \in [-277, -268]$ , and  $r \in [-1150, -1148]$ .
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8. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 6x^2 + 2x + 3$$

- A.  $\pm 1, \pm 3$   
B.  $\pm 1, \pm 2, \pm 3, \pm 6$   
C. All combinations of:  $\frac{\pm 1, \pm 3}{\pm 1, \pm 2, \pm 3, \pm 6}$

- D. All combinations of:  $\frac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 3}$
- E. There is no formula or theorem that tells us all possible Integer roots.
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9. Factor the polynomial below completely, knowing that  $x - 3$  is a factor. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3 \leq z_4$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 8x^4 - 90x^3 + 343x^2 - 510x + 225$$

- A.  $z_1 \in [-5.86, -4.88]$ ,  $z_2 \in [-3.65, -2.93]$ ,  $z_3 \in [-3.38, -2.77]$ , and  $z_4 \in [-0.71, -0.43]$
- B.  $z_1 \in [-5.86, -4.88]$ ,  $z_2 \in [-3.65, -2.93]$ ,  $z_3 \in [-2.14, -0.63]$ , and  $z_4 \in [-0.49, -0.24]$
- C.  $z_1 \in [-5.86, -4.88]$ ,  $z_2 \in [-3.65, -2.93]$ ,  $z_3 \in [-2.84, -2.19]$ , and  $z_4 \in [-0.83, -0.74]$
- D.  $z_1 \in [0.6, 0.85]$ ,  $z_2 \in [2.02, 3.75]$ ,  $z_3 \in [2.3, 3.15]$ , and  $z_4 \in [4.99, 5.07]$
- E.  $z_1 \in [0.14, 0.74]$ ,  $z_2 \in [1.06, 1.46]$ ,  $z_3 \in [2.3, 3.15]$ , and  $z_4 \in [4.99, 5.07]$
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10. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 7x^3 + 5x^2 + 2x + 5$$

- A. All combinations of:  $\frac{\pm 1, \pm 7}{\pm 1, \pm 5}$
- B.  $\pm 1, \pm 7$
- C.  $\pm 1, \pm 5$
- D. All combinations of:  $\frac{\pm 1, \pm 5}{\pm 1, \pm 7}$
- E. There is no formula or theorem that tells us all possible Rational roots.
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11. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 10x^3 - 41x^2 + 27x + 18$$

- A.  $z_1 \in [-3.1, -2.9]$ ,  $z_2 \in [-1.7, -0.7]$ , and  $z_3 \in [0.23, 0.73]$
  - B.  $z_1 \in [-2.9, -1.5]$ ,  $z_2 \in [0.2, 0.8]$ , and  $z_3 \in [2.77, 3.08]$
  - C.  $z_1 \in [-3.1, -2.9]$ ,  $z_2 \in [-1.1, 0]$ , and  $z_3 \in [2.35, 2.69]$
  - D.  $z_1 \in [-3.1, -2.9]$ ,  $z_2 \in [-3.2, -2.7]$ , and  $z_3 \in [0, 0.29]$
  - E.  $z_1 \in [-1.9, 0]$ ,  $z_2 \in [0.8, 2]$ , and  $z_3 \in [2.77, 3.08]$
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12. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{10x^3 + 11x^2 - 106x + 44}{x + 4}$$

- A.  $a \in [9, 11]$ ,  $b \in [-46, -31]$ ,  $c \in [84, 95]$ , and  $r \in [-401, -396]$ .
  - B.  $a \in [-44, -39]$ ,  $b \in [-152, -148]$ ,  $c \in [-703, -700]$ , and  $r \in [-2765, -2760]$ .
  - C.  $a \in [9, 11]$ ,  $b \in [46, 56]$ ,  $c \in [98, 100]$ , and  $r \in [425, 441]$ .
  - D.  $a \in [-44, -39]$ ,  $b \in [168, 175]$ ,  $c \in [-796, -787]$ , and  $r \in [3196, 3209]$ .
  - E.  $a \in [9, 11]$ ,  $b \in [-29, -25]$ ,  $c \in [8, 15]$ , and  $r \in [3, 7]$ .
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13. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{9x^3 - 28x - 19}{x - 2}$$

- A.  $a \in [14, 26]$ ,  $b \in [-36, -34]$ ,  $c \in [40, 45]$ , and  $r \in [-108, -105]$ .
- B.  $a \in [6, 12]$ ,  $b \in [-22, -17]$ ,  $c \in [0, 12]$ , and  $r \in [-35, -34]$ .

- C.  $a \in [6, 12], b \in [6, 15], c \in [-23, -18]$ , and  $r \in [-42, -37]$ .
- D.  $a \in [14, 26], b \in [36, 38], c \in [40, 45]$ , and  $r \in [65, 74]$ .
- E.  $a \in [6, 12], b \in [16, 20], c \in [0, 12]$ , and  $r \in [-8, 1]$ .
- 

14. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 12x^3 + 35x^2 - 9x - 18$$

- A.  $z_1 \in [-1.5, -1.26], z_2 \in [0.92, 1.85]$ , and  $z_3 \in [2.5, 3.1]$
- B.  $z_1 \in [-0.8, -0.64], z_2 \in [0.48, 0.77]$ , and  $z_3 \in [2.5, 3.1]$
- C.  $z_1 \in [-3.17, -2.34], z_2 \in [-1.51, -1.46]$ , and  $z_3 \in [1.1, 2.4]$
- D.  $z_1 \in [-3.17, -2.34], z_2 \in [-0.74, -0.58]$ , and  $z_3 \in [0, 1.1]$
- E.  $z_1 \in [-0.34, -0.12], z_2 \in [1.58, 2.09]$ , and  $z_3 \in [2.5, 3.1]$
- 

15. Factor the polynomial below completely, knowing that  $x - 4$  is a factor. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3 \leq z_4$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 15x^4 - 14x^3 - 248x^2 + 224x + 128$$

- A.  $z_1 \in [-5, -2], z_2 \in [-4.5, -3.89], z_3 \in [-0.08, 0.26]$ , and  $z_4 \in [2, 8]$
- B.  $z_1 \in [-5, -2], z_2 \in [-3.04, -2.45], z_3 \in [0.73, 0.85]$ , and  $z_4 \in [2, 8]$
- C.  $z_1 \in [-5, -2], z_2 \in [-0.52, -0.21], z_3 \in [1.24, 1.46]$ , and  $z_4 \in [2, 8]$
- D.  $z_1 \in [-5, -2], z_2 \in [-1.72, -1.22], z_3 \in [0.18, 0.71]$ , and  $z_4 \in [2, 8]$
- E.  $z_1 \in [-5, -2], z_2 \in [-0.94, -0.69], z_3 \in [2.44, 2.56]$ , and  $z_4 \in [2, 8]$

16. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{9x^3 + 27x^2 - 25x - 77}{x + 3}$$

- A.  $a \in [9, 10]$ ,  $b \in [-2, 2]$ ,  $c \in [-27, -24]$ , and  $r \in [-9, 0]$ .  
B.  $a \in [-32, -24]$ ,  $b \in [107, 111]$ ,  $c \in [-350, -348]$ , and  $r \in [968, 976]$ .  
C.  $a \in [9, 10]$ ,  $b \in [53, 60]$ ,  $c \in [133, 143]$ , and  $r \in [334, 340]$ .  
D.  $a \in [9, 10]$ ,  $b \in [-10, -7]$ ,  $c \in [11, 16]$ , and  $r \in [-121, -118]$ .  
E.  $a \in [-32, -24]$ ,  $b \in [-55, -51]$ ,  $c \in [-188, -186]$ , and  $r \in [-642, -633]$ .
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17. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{10x^3 + 30x^2 - 44}{x + 2}$$

- A.  $a \in [-21, -16]$ ,  $b \in [69, 73]$ ,  $c \in [-140, -137]$ , and  $r \in [232, 243]$ .  
B.  $a \in [-21, -16]$ ,  $b \in [-12, -7]$ ,  $c \in [-21, -15]$ , and  $r \in [-88, -81]$ .  
C.  $a \in [6, 11]$ ,  $b \in [46, 51]$ ,  $c \in [97, 101]$ , and  $r \in [153, 159]$ .  
D.  $a \in [6, 11]$ ,  $b \in [9, 17]$ ,  $c \in [-21, -15]$ , and  $r \in [-4, -3]$ .  
E.  $a \in [6, 11]$ ,  $b \in [-5, 6]$ ,  $c \in [-2, 3]$ , and  $r \in [-50, -42]$ .
- 

18. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 3x^3 + 2x^2 + 4x + 7$$

- A. All combinations of:  $\frac{\pm 1, \pm 3}{\pm 1, \pm 7}$   
B.  $\pm 1, \pm 3$

- C. All combinations of:  $\frac{\pm 1, \pm 7}{\pm 1, \pm 3}$
- D.  $\pm 1, \pm 7$
- E. There is no formula or theorem that tells us all possible Rational roots.
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19. Factor the polynomial below completely, knowing that  $x + 3$  is a factor. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3 \leq z_4$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 10x^4 + 51x^3 - 28x^2 - 333x - 180$$

- A.  $z_1 \in [-0.74, -0.5]$ ,  $z_2 \in [2.94, 3.06]$ ,  $z_3 \in [1.8, 3.3]$ , and  $z_4 \in [4, 5]$
- B.  $z_1 \in [-4.18, -3.74]$ ,  $z_2 \in [-3.13, -2.89]$ ,  $z_3 \in [-0.8, -0.4]$ , and  $z_4 \in [2.5, 3.5]$
- C.  $z_1 \in [-0.47, -0.25]$ ,  $z_2 \in [1.43, 2.14]$ ,  $z_3 \in [1.8, 3.3]$ , and  $z_4 \in [4, 5]$
- D.  $z_1 \in [-2.55, -2.47]$ ,  $z_2 \in [-0.59, 1.11]$ ,  $z_3 \in [1.8, 3.3]$ , and  $z_4 \in [4, 5]$
- E.  $z_1 \in [-4.18, -3.74]$ ,  $z_2 \in [-3.13, -2.89]$ ,  $z_3 \in [-2.8, -1.2]$ , and  $z_4 \in [0.4, 1.4]$
- 

20. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 4x^3 + 4x^2 + 6x + 6$$

- A.  $\pm 1, \pm 2, \pm 3, \pm 6$
- B. All combinations of:  $\frac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 2, \pm 3, \pm 6}$
- C.  $\pm 1, \pm 2, \pm 4$
- D. All combinations of:  $\frac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 2, \pm 4}$
- E. There is no formula or theorem that tells us all possible Rational roots.
-



21. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 8x^3 - 6x^2 - 45x - 27$$

- A.  $z_1 \in [-3.3, -1.7]$ ,  $z_2 \in [0.68, 0.83]$ , and  $z_3 \in [1.44, 1.51]$   
B.  $z_1 \in [-3.3, -1.7]$ ,  $z_2 \in [0.64, 0.69]$ , and  $z_3 \in [1.17, 1.48]$   
C.  $z_1 \in [-2.4, -1.4]$ ,  $z_2 \in [-0.77, -0.75]$ , and  $z_3 \in [2.78, 3.13]$   
D.  $z_1 \in [-3.3, -1.7]$ ,  $z_2 \in [0.3, 0.41]$ , and  $z_3 \in [2.78, 3.13]$   
E.  $z_1 \in [-1.4, -1.1]$ ,  $z_2 \in [-0.7, -0.63]$ , and  $z_3 \in [2.78, 3.13]$
- 

22. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{8x^3 - 8x^2 - 40x - 29}{x - 3}$$

- A.  $a \in [6, 12]$ ,  $b \in [14, 19]$ ,  $c \in [6, 9]$ , and  $r \in [-5, 2]$ .  
B.  $a \in [6, 12]$ ,  $b \in [3, 10]$ ,  $c \in [-27, -22]$ , and  $r \in [-80, -72]$ .  
C.  $a \in [6, 12]$ ,  $b \in [-32, -31]$ ,  $c \in [54, 57]$ , and  $r \in [-197, -193]$ .  
D.  $a \in [24, 32]$ ,  $b \in [63, 69]$ ,  $c \in [152, 155]$ , and  $r \in [427, 428]$ .  
E.  $a \in [24, 32]$ ,  $b \in [-83, -75]$ ,  $c \in [199, 207]$ , and  $r \in [-634, -628]$ .
- 

23. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{6x^3 + 26x^2 - 28}{x + 4}$$

- A.  $a \in [1, 9]$ ,  $b \in [48, 55]$ ,  $c \in [200, 202]$ , and  $r \in [771, 774]$ .  
B.  $a \in [1, 9]$ ,  $b \in [-4, 0]$ ,  $c \in [19, 28]$ , and  $r \in [-130, -124]$ .  
C.  $a \in [1, 9]$ ,  $b \in [1, 5]$ ,  $c \in [-12, -4]$ , and  $r \in [-1, 10]$ .

- D.  $a \in [-24, -22]$ ,  $b \in [-73, -66]$ ,  $c \in [-283, -279]$ , and  $r \in [-1154, -1140]$ .  
E.  $a \in [-24, -22]$ ,  $b \in [121, 123]$ ,  $c \in [-491, -483]$ , and  $r \in [1921, 1929]$ .
- 

24. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 16x^3 - 40x^2 + x + 30$$

- A.  $z_1 \in [-2.25, -1.94]$ ,  $z_2 \in [-1.04, -0.34]$ , and  $z_3 \in [0.79, 1.94]$   
B.  $z_1 \in [-1.34, -0.77]$ ,  $z_2 \in [0.55, 0.88]$ , and  $z_3 \in [1.9, 2.19]$   
C.  $z_1 \in [-2.25, -1.94]$ ,  $z_2 \in [-1.46, -1.14]$ , and  $z_3 \in [0.51, 0.89]$   
D.  $z_1 \in [-1.28, -0.5]$ ,  $z_2 \in [1.07, 1.34]$ , and  $z_3 \in [1.9, 2.19]$   
E.  $z_1 \in [-5.28, -4.63]$ ,  $z_2 \in [-2.05, -1.9]$ , and  $z_3 \in [-0.1, 0.58]$
- 

25. Factor the polynomial below completely, knowing that  $x - 4$  is a factor. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3 \leq z_4$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 15x^4 - 59x^3 - 50x^2 + 208x - 96$$

- A.  $z_1 \in [-4, -3]$ ,  $z_2 \in [-1.68, -1.66]$ ,  $z_3 \in [-0.81, -0.63]$ , and  $z_4 \in [1.7, 2.7]$   
B.  $z_1 \in [-2, 1]$ ,  $z_2 \in [0.62, 0.9]$ ,  $z_3 \in [1.57, 1.69]$ , and  $z_4 \in [3.9, 5.2]$   
C.  $z_1 \in [-4, -3]$ ,  $z_2 \in [-1.44, -1.27]$ ,  $z_3 \in [-0.67, -0.6]$ , and  $z_4 \in [1.7, 2.7]$   
D.  $z_1 \in [-4, -3]$ ,  $z_2 \in [-3.02, -2.95]$ ,  $z_3 \in [-0.44, -0.14]$ , and  $z_4 \in [1.7, 2.7]$   
E.  $z_1 \in [-2, 1]$ ,  $z_2 \in [0.55, 0.65]$ ,  $z_3 \in [1.28, 1.46]$ , and  $z_4 \in [3.9, 5.2]$
-

26. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{12x^3 - 4x^2 - 40x + 37}{x + 2}$$

- A.  $a \in [-32, -22]$ ,  $b \in [-55, -47]$ ,  $c \in [-151, -142]$ , and  $r \in [-251, -245]$ .  
B.  $a \in [-32, -22]$ ,  $b \in [36, 49]$ ,  $c \in [-129, -124]$ , and  $r \in [292, 296]$ .  
C.  $a \in [12, 13]$ ,  $b \in [-32, -24]$ ,  $c \in [11, 19]$ , and  $r \in [4, 9]$ .  
D.  $a \in [12, 13]$ ,  $b \in [-43, -38]$ ,  $c \in [79, 82]$ , and  $r \in [-205, -196]$ .  
E.  $a \in [12, 13]$ ,  $b \in [18, 26]$ ,  $c \in [0, 1]$ , and  $r \in [29, 47]$ .
- 

27. Perform the division below. Then, find the intervals that correspond to the quotient in the form  $ax^2 + bx + c$  and remainder  $r$ .

$$\frac{16x^3 - 48x - 28}{x - 2}$$

- A.  $a \in [32, 33]$ ,  $b \in [-64, -59]$ ,  $c \in [80, 83]$ , and  $r \in [-195, -187]$ .  
B.  $a \in [12, 23]$ ,  $b \in [-35, -27]$ ,  $c \in [9, 21]$ , and  $r \in [-60, -53]$ .  
C.  $a \in [12, 23]$ ,  $b \in [26, 33]$ ,  $c \in [9, 21]$ , and  $r \in [3, 5]$ .  
D.  $a \in [32, 33]$ ,  $b \in [61, 67]$ ,  $c \in [80, 83]$ , and  $r \in [130, 141]$ .  
E.  $a \in [12, 23]$ ,  $b \in [15, 17]$ ,  $c \in [-39, -28]$ , and  $r \in [-60, -53]$ .
- 

28. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 2x^2 + 3x + 7$$

- A. All combinations of:  $\frac{\pm 1, \pm 2}{\pm 1, \pm 7}$   
B. All combinations of:  $\frac{\pm 1, \pm 7}{\pm 1, \pm 2}$   
C.  $\pm 1, \pm 7$

- D.  $\pm 1, \pm 2$
- E. There is no formula or theorem that tells us all possible Integer roots.
- 

29. Factor the polynomial below completely, knowing that  $x - 4$  is a factor. Then, choose the intervals the zeros of the polynomial belong to, where  $z_1 \leq z_2 \leq z_3 \leq z_4$ . *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 25x^4 - 80x^3 - 132x^2 + 224x - 64$$

- A.  $z_1 \in [-2, 2]$ ,  $z_2 \in [-0.17, 0.41]$ ,  $z_3 \in [0.76, 0.9]$ , and  $z_4 \in [3, 6]$
- B.  $z_1 \in [-5, -3]$ ,  $z_2 \in [-1.71, -0.25]$ ,  $z_3 \in [-0.63, -0.31]$ , and  $z_4 \in [1, 3]$
- C.  $z_1 \in [-5, -3]$ ,  $z_2 \in [-2.13, -1.06]$ ,  $z_3 \in [-0.19, 0.06]$ , and  $z_4 \in [1, 3]$
- D.  $z_1 \in [-2, 2]$ ,  $z_2 \in [1.21, 2.56]$ ,  $z_3 \in [2.4, 2.52]$ , and  $z_4 \in [3, 6]$
- E.  $z_1 \in [-5, -3]$ ,  $z_2 \in [-2.8, -2.06]$ ,  $z_3 \in [-1.34, -1.19]$ , and  $z_4 \in [1, 3]$
- 

30. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 6x^3 + 4x^2 + 4x + 7$$

- A.  $\pm 1, \pm 2, \pm 3, \pm 6$
- B. All combinations of:  $\frac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 7}$
- C.  $\pm 1, \pm 7$
- D. All combinations of:  $\frac{\pm 1, \pm 7}{\pm 1, \pm 2, \pm 3, \pm 6}$
- E. There is no formula or theorem that tells us all possible Integer roots.
-